

THIS WEEK AT ICP!

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Message from the Director

• The Institute on Climate and Planets (ICP) was created in 1994 to involve New York City students and teachers in NASA's climate change research program. ICP draws underrepresented minorities into our science community and reaches out to their schools with research education activities.

• In the 2002 Summer Institute ICP welcomes 40 students and 15 faculty from New York City area junior highs, high schools, and colleges as NASA Research Fellows at the Goddard Institute for Space Studies. As many as 17 GISS researchers contribute their time and expertise to collaborating on climate research with these students and educators.

• We are pleased to present this first issue of the ICP Summer Institute Newsletter prepared by three of our student research fellows.

• Carolyn Harris, ICP Director



JIM HANSEN RAISES ICP PARTICIPANTS' AWARENESS OF GLOBAL WARMING

Dr. James Hansen, an Iowa native who holds a Ph.D. from the University of Iowa, is the head of NASA's Goddard Institute for Space Studies, where the Institute on Climate and Planets is based. Hansen has been at GISS since 1967, when he began to study the clouds of Venus and several years later began to study climate change on Earth. "It was a very exciting time," said Hansen of the 1960's, in relation to the development of climate models. As keynote speaker for ICP's orientation activities, Dr. Hansen decided to give a talk on global warming. The staff of *This Week At ICP* felt that it would be a good idea for us to share some of his wisdom with the distinguished readers of our publication.

According to Dr. Hansen, the public's understanding of global climate change is "not always that good." He spoke fondly of one of his former colleagues, Jim Pollack, who introduced him

to research aimed at answering the question "How sensitive is the Earth's temperature to a forcing?" (A forcing, in the study of climate, is anything that affects the radiative balance of the Earth, which has a consequence on Earth's climate.) From the Industrial Revolution onward, we have been adding anthropogenic (human-made) forcings into the



Jim Hansen, Head, NASA Goddard Institute for Space Studies

mix – carbon dioxide, for example, which is a greenhouse gas, from the burning of coal. Pollack was

working on a one-dimensional computer model to simulate climate change, while Dr. Hansen chuckled as he did his quick and dirty "back-of-the-envelope" calculations using a simple physics law to answer the question of climate sensitivity. Dr. Hansen, although initially convinced that his simple calculation yielded a good answer, eventually realized that perhaps Pollack's more complex climate model was a bit more accurate.

Climate modeling has come a long way since then, but there is still much uncertainty as to the output of these models. He cautions that since "the climate system has inertia," it will take the Earth many decades to respond to today's human-made forcings.

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ORIENTATION...LEARNING TO WORK TOGETHER

There was a variety of orientation activities during the first day of the ICP Summer Institute. One of the more hands on activities was the investigation in New York City's Morningside Heights. The students and teachers were divided into eight groups and given forty-five minutes to record and observe their surrounding environment. The teams were instructed to note as many human and natural factors as possible that could influence the earth's temperature and in turn could be influ-

enced by climate change.

The second task was to determine what effect those variables will have on the climate and vice versa. A presentation was made to strengthen the teams' skills in synthesizing information and learning or reviewing the major components of a research paper: background, methods, results, and discussion. The research and observation conducted outside demonstrates the importance of practical skills learned at the summer institute. As future

engineers, scientists, doctors, and etc. observation and recording data efficiently and effectively is vital.

One key aspect of the ICP summer program is the opportunity for students and teachers to work together on common ground with research scientists at GISS and achieve a better understanding of one another to improve relations. David E. Anstey exclaimed, "It was interesting to work with experienced researchers. It was an opportunity to not only observe

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GLOBAL WARMING...(CONT'D)

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Therefore, immediate changes will be limited, but we should be prepared for potential changes in the long term. In 50 years, we can expect the forcings from greenhouse gases to add a certain amount of energy to the atmosphere. This additional energy could possibly exacerbate the current delicate climate balance.

So what can be done? Dr. Hansen states that we should consider common sense strategies to reduce the growth of greenhouse gases. He cites research by Amory Lovins, done in 1976, which states "if we would use energy more efficiently, the need for it would decline." Unfortunately, as of recent times, the United States'

and global energy usage is on the rise.

One of the ICP research projects,



Dr. Hansen looks on as participants receive guidance for an orientation activity

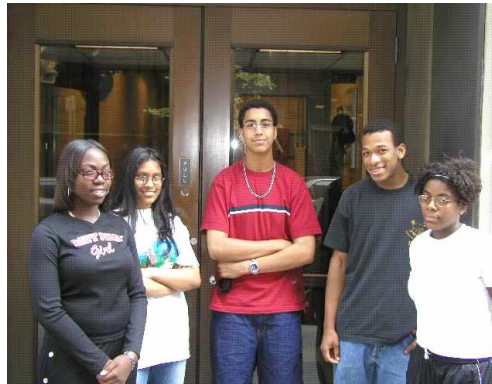
The Alternative Scenario Team, deals with energy and climate change. Many ICP participants felt that it was a privilege to have the

opportunity to hear Dr. Hansen's remarks, and feel that as a result of his talk, they better understand the complex climate problems that they are studying. Students called his remarks "informative and enlightening," and feel that they now understand the significance of the work that they do here at ICP – real research aimed at contributing to real problems which will affect us all, one way or another, in the future.

"It was an opportunity to not only observe our surroundings but see the way that other people interpreted our everyday environment".

SHARP MINDS, SHARP STUDENTS

For the second year in a row, the Institute on Climate and Planets is privileged to be a part of NASA's Student High School Apprentice Research Program (SHARP) program. A total of six students were selected from a regional pool of candidates to do research at NASA Goddard Institute for Space Studies this summer supported by



SHARP. They are also part of the larger ICP community. Participants from left to right include: Damilola Alade, Amelia Prasad, David Antsey, Keith Morancie, and Amelia Adams. Missing from the photo is Salvador Santacruz who was in Black Rock Forest conducting a carbon field investigation.

ORIENTATION...(CONT'D)

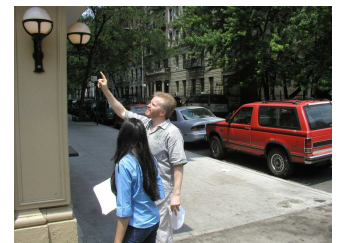
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our surroundings but see the way that other people interpreted our everyday environment".

To introduce the new recruits to the principles of climate and each other, there was an icebreaker. There are many different nationalities represented at ICP.

The activity produced

a snapshot of the world's climates. The students and educators interviewed each other to learn of their coworker's ethnic background, geographic region, and how climate influences the way people live in that region. One student, Tanya Martinez, said "I was surprised to learn that my culture is very similar to many others, even if they live halfway across the world!"



Pat Cushing (New Rochelle HS) and Tania Penafort (HS for Environmental Studies) observing man-made material that could affect NYC's temperature.

“SCIENCE AND SOCIETY” SEMINAR SERIES

The students, faculty, and scientist at Summer Institute at the GISS Institute for Climate and Planets (ICP) have the opportunity to attend three “Science and Society” seminars. Each session features a guest speaker who has a background in the sciences. After the talk, the members of Summer Institute ask questions related to the talk or an assigned article related to the speaker’s presentation topic. The purpose of the seminars is, as the title suggests, connecting the science research the students and faculty are working on with the society and world outside. With these talks followed by questions and answers, researchers at Summer Institute look to connect their specific research projects to a bigger, more general problem faced by society



Gordon Aubrecht, Professor and ICP’s first Science and Society Seminar Speaker

Gordon Aubrecht was our first speaker. Dr. Aubrecht is part of the Contemporary Physics Education Project and author of the book “Energy”, among other things.

His talk focused on the inevitable interconnectedness between energy and population. When one looks at population for the past thousand years, one can observe that it has grown exponentially. Citing Bartlett’s 1st and 2nd law of sustainability: that population and/or consumption of resources cannot be infinitely sustained and that as population increases the rate of consumption also rises, Aubrecht brings to the light the current problem of overpopulation and dwindling resources for energy. As population increases, asserts Aubrecht, different ways to use and produce energy evolve. For example,

in the past, when population was lower, hydroelectric power was able to sustain most of the population in the United States. As the population rose and hydroelectric power could no longer support the large population, people became dependent on other forms of energy: non-renewable fossil fuels.

Today countries, especially the United States, are using these forms of energy at an alarming rate. People are now using, says Aubrecht, 20% more energy than is being regenerated. In fact, Aubrecht states that the United States oil will be gone by 2060, seeing its peak production year in 2002. In searching for solutions for the problem of decreasing resources of energy, Aubrecht looked into the Kyoto Protocol. Although the United States did not sign off on the protocol, he says it would not have been a great expense and would actually have saved the United States money in the long run. One reason being that the US, with decreasing energy sources will become more and more dependent on imported energy.

After Aubrecht finished his lecture, students asked what was truly the problem, seeing as other countries also have growing populations and a need for energy. Aubrecht answered that one of the major challenges to address when looking at the energy problem is the political clout of the energy industry. Also the fact that the American people have long been used to consuming a lot of energy makes it difficult to change energy practices.

When asked if and how can people’s minds in the United States be changed, the scientist said if people could be made to listen and become more aware of the energy problem, things could begin to move faster. The United States could start to look toward examples of other countries that run on less energy and give government subsidies to renewable and alternative energy sources that allow for the longer life of the sources of energy.

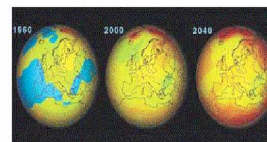
Aubrecht does not hesitate to stress that it will be difficult to change something that has been the same for so long. He gave the anal-

ogy of the challenge it would be to convince a person who has been drinking coffee all his life to suddenly start drinking tea.

While they realize that underlying hindrances in accelerating change of current energy use are public thought and politics, students and faculty, look to minimize the uncertainty of the magnitude of human actions on energy, and in turn, on climate. In this way, the public can be better informed in the result of their actions and decisions.

Dr. Gordon Aubrecht’s talk helped each research group connect their research projects on various aspects of climate to a larger question. Of course, as Aubrecht himself said, “science does not prove, it only disproves.” However, with their research, the students and faculty researchers at the GISS ICP Summer Institute hope to solve at least a small piece of the large and complicated puzzle that is climate.

A warmer future



Source: German Climate Computing Center

An image from Aubrecht’s talk shows the predicted warming in the Earth. The last globe is Earth in 2040.

“While they realize that underlying hindrances in accelerating change of current energy use are public thought and politics, the scientists here at ICP, as well as the students and faculty, look to minimize the uncertainty of the magnitude of human actions on energy, and in turn, on climate.”

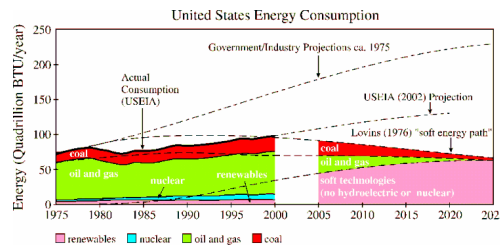
ICP TEAM CLOSE UP

This week's highlighted teams both work on the climate influence of particular greenhouse gases. The Alternative Energy Scenario Team, focuses on carbon dioxide, is composed of three high school students, two college students,

three teachers, and three scientists, including Dr. James Hansen. The project came about from Dr. Hansen's Alternative Scenario paper. Their project involves creating alternative energy use scenarios to reduce carbon dioxide emissions for

the next ten and twenty years. They plan to first look at the past trends of alternative energy sources such as solar and wind power as well as the improvement of efficiency in various en-

ergy sources in order to suggest plausible alternatives to current energy use. In finding the potential and realistic applicability of these alternatives, the team hopes to observe the possibility of reducing carbon dioxide emissions from fossil fuels to a zero percent growth rate. Being able to support the feasibility of these scenario could potentially be the source that policy makers need in order to make more informed decisions on energy production and consumption, ultimately reducing carbon dioxide emissions and, in turn, the greenhouse gas' warming effect.



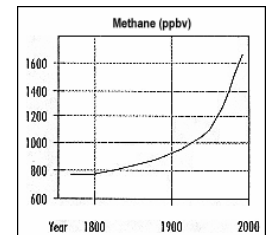
Alternative Scenario Graph demonstrating possible scenarios regarding future energy usage.

“Being able to support the feasibility of these scenarios could potentially be the source that policy makers need in order to make more informed decisions on energy production and consumption, ultimately reducing carbon dioxide emissions and, in turn, the greenhouse gas’ warming effect.”

The second team, the Methane Team, deals with methane. This team is composed of two high school students, one college student, two teachers, and one scientist, Elaine Matthews. The team has several projects going on at the same time. One is updating a methane web site and its data. Another project is aimed at producing a more comprehensive data set on rice cropping cycles and cultivation to conduct new and enhanced methane trend analysis. The third project for the Methane Team arose from last year's Alternative Scenario project. Instead of looking at carbon dioxide emissions, the Methane Team will look at methane emissions scenarios. They will analyze different scenarios regarding future emissions of methane. They are trying to find the most realistic scenarios that project these emissions. Continually updating and increasing

their data sources is very important in getting the best handle on these scenarios. The more accurate and complete their data is, the more realistic their scenarios will be. Being able to create the most realistic scenarios possible is essential to understanding the influence of this gas' on climate.

Students and teachers in both teams appreciate being in their groups and in the ICP program as a whole. Teachers say it helps them greatly in their teaching to gain a different perspective on teaching. Teacher Christina Cambronero says that as a new high school teacher, getting to work with high school students in this environment helps her get practice teaching at that level. Students in both groups say that working at ICP is useful to increase their knowledge in science. It also helps them, they say, to acquire skills they



Graph showing increasing amounts of methane in recent years

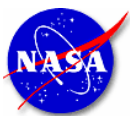
will need in the workforce. Not only are they learning technical skills but they are learning to work with other people cooperatively and learning to accept criticism. Ultimately, for them it is a growing experience.

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**This Week at ICP
Summer Institute 2002
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Crissaris Sarnelli
HS for Environmental Stud-
ies
Entering freshman Yale Univer-
sity

Marquise McGraw
Bronx HS of Science
Entering freshman Cornell
University

Anna Ruvinskaya
Brooklyn Technical HS

REFLECTIONS ON ICP'S FIRST WEEK

"You all have a very unique opportunity – the opportunity to look at a piece of the climate problem, and in some way, help reduce the uncertainty," said Carolyn A. Harris, the Director of ICP, as she addressed the newest group of ICP students and teachers in this year's program. This diverse collection of 40 students and 18 teachers from New York City is an ethnically diverse group, whose backgrounds span the entire globe – places like France, Eastern Europe, India, Turkey, Africa, Antigua, and the Dominican Republic – just to name a few – and have decided to devote six weeks of their summer to the study of climate change.



**Students, teachers, and scientists discuss-
ing influences on local regional climate.**

The orientation activities, provided everyone with the chance to learn the scientific methods of inquiry that are not always emphasized in the high school curriculum. Students collectively felt that the activities were engaging, unique, and were beneficial in preparing them for the research tasks that they will be doing for the remainder of the program.

Tony DelGenio, a research scientist at GISS, culminated the orientation activities by speaking to the Summer Institute participants on the topic "Why Earth's Weather and Climate Is Such a Puzzle" in order to enable them to better understand the complexities of the climate system. He likened our climate system to a sink, with inputs from faucets and outputs from drains, in the same way that in our environment, our energy input comes from the sun, and our output is the infrared energy that is re-radiated from the planet. It is the imbalances from

these inputs that keep a sink full, in the same way that the imbalances in the atmosphere drive our climate. Zelma Ortiz, a high school student, remarked that she "enjoyed his speech. I loved his analogy. He made the complex climate system easy to understand." This is a skill that ICPers are expected to learn as well – the skill of explaining their research and its relevance to the rest of society.

The Student Working Group is a weekly forum which is designed to enable the students to prepare questions for the Science and Society Seminar speakers, as well as to provide opportunities for students to come together to discuss and critique articles related to the broad study of climate change. These workshops have proven to be extremely successful. The group, facilitated by two students, Marquise McGraw and Crissaris Sarnelli, provides the critical opportunity that these students need – to learn how to ask the experts thoughtful questions, to learn how to critique their fellow students' ideas in a professional manner, and to provide an opportunity for them to not only build working relationships that will last far beyond the end of the program, but to foster a sense of community among the ICP participants as well. Amelia Prasad, a high school student with ICP, felt that "the workshops are very productive, thought-provoking, and foster a positive work environment."

The science faculty in the program feel that they have learned something equally important: how what they teach in the academic realm applies to what actually goes on in practice. Mr. Robert Gandolfo, a teacher at Plainedge High School, feels that the faculty seminars are a

"productive step toward develop-



**Students present their questions for the
speaker in the Student Working Group**

ing useful curricula for the high school classroom."

We have all learned something immensely important in this short amount of time: the value of team work. ICP prides itself on creating an environment where students, teachers and scientists work in a cooperative effort to tackle problems related to the research scientists' interests at GISS. This has proven to be an approach beneficial to all who participate in this program.

In this short time, we also have begun to realize that critical thinking and inquiry skills play a key role in the research environment, as well as every day life. The ability to think critically and creatively is a necessary skill in all aspects of our work, which will aid us in our work at ICP and beyond. According to Damilola Alade, a NASA SHARP student in ICP, "my ways of thinking about situations have changed. I have become more open-minded, I have broadened my horizons, and I feel that I have been exposed to a once-in-a-lifetime opportunity, which will really help me in my future endeavors." Although we are all not scientists as of yet, it seems that many of us are well on our way, thanks to ICP.



**GISS Scientist Tony Del Genio
addresses ICP participants**